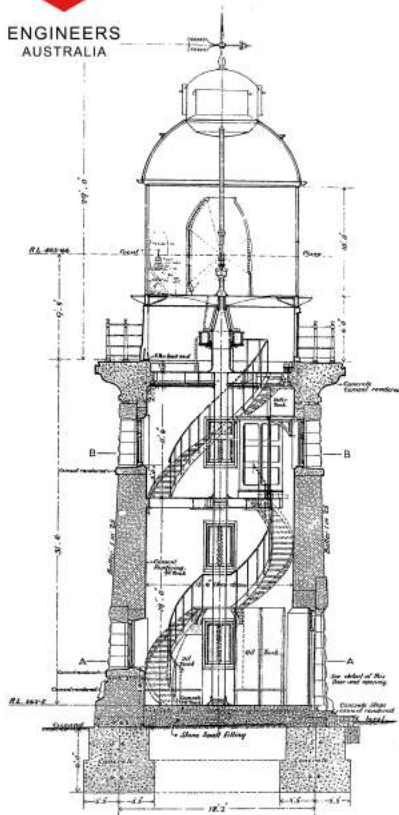




ENGINEERS  
AUSTRALIA



Original design drawing (State Library WA)



For more details of this and other engineering heritage awards, go to  
[www.engineersaustralia.org.au/heritageregister/search](http://www.engineersaustralia.org.au/heritageregister/search)

# A GUIDING LIGHT FOR STATE DEVELOPMENT

## THE COUNTRY NEEDS COASTAL LIGHTS IN THE SOUTH WEST

The need for new lighthouses on the south west coast to protect vessels travelling from Europe to the eastern colonies, and also local shipping, was noted in 1873 during an Inter-Colonial Conference. Two lights were recommended, one at Cape Hamelin for the benefit of vessels travelling from Europe to eastern Australia, and one on Cape Naturaliste, approximately 100 km to the north, for the benefit of local industry. The location of the proposed Cape Hamelin light was later changed to the nearby Cape Leeuwin.

The Cape Leeuwin lighthouse was given priority and was opened in 1896. Pressure from the growing timber industry for safer coastal transport led to the construction of the Cape Naturaliste lighthouse, commencing in 1902 and opened in 1903.

Prior to this time, local shipping relied on 'The Tub', a barrel set atop of 30 foot pole on the waterfront at Busselton in 1836, to mark the best landing place for passengers and stores. It lasted for 34 years before being replaced by a small wooden light house.

Because the Cape Naturaliste lighthouse could be located on a high headland, a tall tower like that at Cape Leeuwin was not needed. Although of smaller stature (20 meters high) the lighthouse is an aesthetically pleasing example of late 19th century lighthouse technology.

## EMINENT PERSONS ASSOCIATED WITH THE LIGHTHOUSE

Charles Stuart Russel Palmer, Western Australian Engineer in Chief. Palmer oversaw the lighthouse tower design and its construction.

James Timmins Chance of Chance Brothers, the firm that supplied the Cape Naturaliste lens system. James Chance led the company into the lighthouse illumination business, which dominated lighthouse optics in the British empire for 100 years.

William Tregarthen Douglass - the British consulting engineer who designed the lantern room.

## CHANCE BROTHERS' LENS TECHNOLOGY



James Timmins Chance 1902  
(Portrait by Joseph Gibbs;  
Photo: Sandwell Museums  
Service Collection)

One of the giant Fresnel dioptric lens assemblies in the Cape Naturaliste lantern room, showing the central bullseye and the surrounding segmented prismatic lenses - still in operation today  
(Photo: Fiona Bush)



The optical apparatus was designed and manufactured by Chance Brothers of the UK. The company initially specialised in 'crown' window glass, supplying glazing for the 'Crystal Palace' to house the Great Exhibition of 1841, the British Houses of Parliament and the four faces of the Westminster clock tower housing 'Big Ben'.

A young member of the family, James Timmins Chance, developed a fascination with the optical qualities of glass and its application in lighthouses, leading the company into the lighthouse optics business.

French optical scientist, Augustin Fresnel, had earlier devised the 'dioptric' lens, consisting of a small central bullseye lens surrounded by an array of concentric segmented prismatic lenses. James Chance adopted the technology and took it further to produce massive lenses to direct a light beam further than ever before.

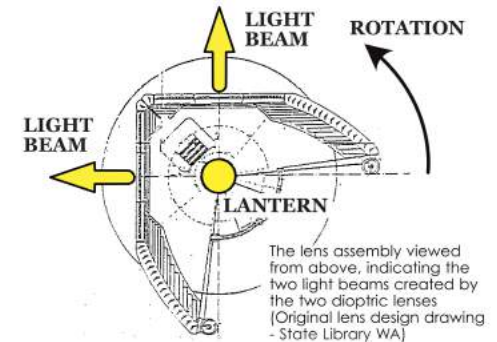
But large lenses are heavy. How can these be rotated to produce a flashing light? Another French development solved the problem by placing the lens on a turntable suspended on a bath of mercury, reducing friction. The lens was rotated by a clockwork mechanism.

Chance Brothers adopted this technology too. The Cape Leeuwin Lighthouse was their first implementation of the technology worldwide. The Cape Naturaliste light followed just 7 years later. The lens and mercury flotation systems built and supplied by Chance Brothers remain in operation in both lighthouses today.

## A COMPLEX FLASH SIGNATURE

Lighthouses were often equipped to produce a single flash at a particular rate. This becomes the recognisable characteristic of the lighthouse which helps ships to identify their exact location. In order to avoid potential mis-identification some were given more complex flash signatures. The flash characteristic required for the Cape Naturaliste lighthouse was 2 flashes separated by 2.5 seconds, repeated every 10 seconds.

To achieve this characteristic the Cape Naturaliste lens system consisted of two Fresnel dioptric lenses mounted at right-angles to each other on the turntable, as indicated in the diagram below. Illumination came from a kerosene lantern placed at the centre of the turntable.



The segmented prismatic lenses and the central bullseye of each dioptric lens assembly captured the light from the lamp and sent it out as a parallel beam. The combination of two dioptric lenses produced two beams, each sweeping across the horizon. As the turntable rotates at the constant speed of one full rotation per 10 seconds, the eye of a navigator on a distant ship will see two flashes separated by 2.5 seconds as the beams pass across their vision, then nothing for another 7.5 seconds, when the sequence repeats.

Engineering Heritage National Markers were awarded to the Cape Leeuwin and Cape Naturaliste Lighthouses on 7th December, 2018. The 'National' level of the award acknowledges the engineering innovations employed and the importance of the lighthouses to the development of the whole nation.

